VOL. VII. JULY, 1934. NO. 3.

Journal

OF THE

Kansas Entomological Society

PUBLICATION COMMITTEE

PAUL B. LAWSON, Editor, Lawrence
ROGER C. SMITH, Manhattan R. H. PAINTER, Manhattan
W. KNAUS, McPherson DWIGHT ISELY, Fayetteville, Ark.

EDWIN A. POPENOE
1853—1913

Entered as second-class matter December 31, 1927 at the Post-Office at McPherson, Kansas, under the Act of August 24, 1912.

Kansas Entomological Society

Vol. VII, No. 3. July, 1934.

BIOLOGICAL NOTES ON GONIOPS CHRYSOCOMA (O. S.) (DIPTERA: TABANIDAE)

H. H. SCHWARDT,

*Fayetteville, Arkansas**

The observations on **Goniops chrysocoma** (O. S.) recorded in this paper were made in Washington County, Arkansas, during the years 1931-1932. Four hundred larvae have been collected, from which 52 adults were reared. Records on all stages of the fly, except the exact duration of the larval period, are included. So far as this locality is concerned, the species is not economically important and this study was incidental to an investigation dealing with the economic species of the state.

Hine (5), Walton (11), McAtee (7), and Malloch (8) have published notes on one or more stages of this horse-fly. Walton collected two female flies along with their egg masses near Highspire, Pennsylvania. One of the masses contained 534 eggs. He estimated the incubation period to be 7 to 10 days. The newly hatched larvae were placed in various rearing media, but all refused food of any kind and died within a few weeks. Walton's paper includes a figure of the adult female fly. McAtee described a first stage larva which he reared from the egg, and a full grown larva and a pupa collected earlier by Pergande. He noted the fly's habit of guarding her eggs, buzzing intermittently or when disturbed, and adding eggs to the mass over a period of days. This latter habit has not been observed in Arkansas. He believed that the larvae led a subterranean life. Photographs of all stages of the fly are included in McAtee's paper. Hine (5) observed the fly's habit of buzzing at intervals when at rest on a leaf.

Pangonia chrysocoma was originally described by Osten Sacken (9) in 1875. In 1892 Aldrich (1) described **Goniops hippoboscoides,** which Hine (5) soon

*Research Paper No. 349, Journal Series, University of Arkansas.

found synonomous with **P. chrysocoma** O. S. Hine, however, considered the genus **Goniops** valid, because of the angulate eyes of the female, and suggested its retention for Osten Sacken's species **chrysocoma.** Aldrich (2) agreed, but later in his catalog (3) questioned the validity of **Goniops.** The genus has stood.

In the spring of 1932, while collecting other terrestrial Tabanid larvae, two grown larvae of **G. chrysocoma** were taken. The area in which these were found lies on a hillside with an average slope of about twenty degrees, and with an east exposure. The soil is thin and littered with limestone rocks of various sizes which have broken from a bare stratum near the top of the slope. The entire hillside is shaded by large hard maples and oaks, the maples predominating in number. A brief flat spot near the center of the area accomodates a small pond, which is partly filled with flags and sedges, and supports an unusually various and profuse aquatic fauna. Fallen leaves, undisturbed for years, cover the ground and in places are from eight to twelve inches deep.

In addition to larvae of **Goniops,** those of **Tabanus annulatus** and a larger species from which no adults have yet been reared, were collected in this area. The **Tabanus** larvae were occasionally found between the leaf carpet and the soil, along with those of **Goniops,** but more frequently were taken from fallen decayed logs. A considerable series of **T. annulatus** larvae were taken from a small decayed portion near the base of a living oak tree. Persistent collecting in this area between March and June yielded a total of over 400 larvae in various stages of development. Nearly all of these were found on the surface of the soil covered by an accumulation of fallen leaves. Occasionally a larva was found under a rock or log. These larvae were placed in jelly glasses filled with soil taken from the habitat, and in this medium the larger larvae soon pupated. Sixty pupae were reared and 52 of these produced adults.

Several other maple-covered hillsides have been examined carefully but no evidence of the presence of **G. chrysocoma** has been found on any of them, or in any other place except the one isolated area described.

The Egg and the Incubation Period

Like other members of the family Tabanidae, **G. chrysocoma** deposits its eggs in masses which usually

contain several hundred eggs. Three masses from which the larvae were counted produced 348, 327, and 150 larvae respectively. One mass, the deposition of which was observed, required 7 days for incubation.

The oviposition habits of **G. chrysocoma** are somewhat unique among Diptera. Every egg mass except one collected in Northwest Arkansas has been attached to the under side of a leaf of hard maple. One mass was fastened to a leaf of red bud. Walton (11) observed oviposition on a leaf of **Angelica** sp. and on a wild cherry leaf. McAtee (7) found egg masses on leaves of oak and various other plants. Having deposited the last egg, the female assumes a standing position over the eggs, so that her abdomen touches and forms a complete roof over them. She forces her tarsal claws entirely through the leaf, so that her position is very secure, and remains until death intervenes, or she is forcibly removed. A twig, bearing leaf, egg mass, and female fly can be removed from the tree, hauled several miles to the laboratory, photographed, and subjected to other unusual treatment without any apparent disturbance to the fly. The intermittent vibration of the wings observed by Hine (5), Walton (11), and McAtee (7), which closely resembles the sound produced by drawing the edge of a card rapidly across a comb, occurs somewhat more often when the fly is treated roughly. Egg masses from which the flies are removed hatch normally. Usually the female dies and falls from the mass a few hours after the eggs hatch.

Hymenopterous parasites determined by C. F. W. Muesebeck as **Telenomus goniopis** Cwfd., destroy a considerable proportion of the eggs of this species. The first masses deposited during the 1932 season were comparatively free from parasitism, but as the season progressed an increased number of eggs were destroyed, and late in the oviposition period many blackened masses were collected which produced from 100 to 200 parasites and not a single Tabanid larva. Egg parasitism of equal efficiency has been reported by Herms (4) for a hymenopteron attacking eggs of **Tabanus punctifer** in the Sacramento valley. Parman (10) observed 93 per

cent parasitism of **Tabanus hyalinipennis** eggs by **Phanurus emersoni** Girault in Uvalde County, Texas.

The Larva and the Larval Period

Both the newly hatched and full grown larvae have been described in detail by McAtee (7). The larvae vary in color from nearly white, just after a molt, to dark dirty yellow. They are bottle-shaped when extended, but when the anterior segments are drawn in, as they invariably are when a larva is disturbed or handled, their appearance closely approaches that of **Gastrophilus** larvae.

Although part of a series of 400 collected and 150 reared larvae have been under observation for nearly a year, little has been learned about their food requirements. Earthworms, crustaceans, and insect larvae which are readily eaten by most Tabanid larvae are not attractive to this species. Large numbers of larvae of various sizes have been kept together with no apparent evidence of cannibalism. Examination of the alimentary tracts from several large larvae collected in the field revealed nothing that the writer was able to identify as plant or animal material. Newly hatched larvae kept in soil from the natural habitat lived for several months but failed to grow or to survive the winter. Larvae in various stages of development can be found at all times of the year, which suggests a larval period of more than one year.

The Pupa and the Pupal Period

The pupa of **Goniops chrysocoma,** which McAtee (7) has described in detail, differs from most tabanid pupae in that the mesothorax is three times the length of the prothorax, and the rows of spines around the abdominal segments are "not continuous but interrupted and definitely grouped."

Pupation occurs in the larval habitat and no cell or other protection for the pupa has been observed. The first pupa was observed in the insectary April 9 and in the field April 16. They were numerous in the field until the third week in May and after May 22 not a single pupa could be found in the field, though larvae were numerous, and no more transformations occurred in the insectary where a large number of apparently full grown larvae were under observation till late in October. The average pupal period was 23.2 days. (See Table I.)

Table I. **Goniops chrysocoma** (O. S.) Fayetteville, Arkansas, 1932. Duration of the pupal period.

Period in days	Number of pupae	Period in days	Number of pupae
16	1	23	10
19	1	24	7
20	1	25	10
21	5	26	2
22	6	27	1

Average pupal period, based on 44 records....23.2 days

The Adult

The adult female fly is slightly larger than the common blue bottle fly. The wings are pictured, narrow, and long, half their length extending beyond the tip of the abdomen. When at rest they are widely spread so that only a narrow margin on each side of the abdomen is covered. The entire abdomen and dorsum of the thorax are densely covered with golden yellow hair. The front, face, antennae, palpi, and legs are of the same yellow color. The eyes are dark brown and acutely angulate at the upper inner corners. The ocellar area is dark brown. The mouthparts are directed forward at a slight angle instead of straight down as in most **Tabanidae.** The male resembles the female in general configuration, but its coloration is strikingly different. The wings and legs are much like those of the female, except that the coxae and femora are brown. Except for the narrow yellow posterior margin on each abdominal segment, the roots of the wings, and the antennae, the body is dark brown, the abdomen being slightly darker than the thorax. For a technical description consult either Osten Sacken (9), or Hine (6).

The first adult emerged in the insectary May 12 and the last June 7. Field cages placed over areas known to contain larvae caught only two emerging flies, one on May 20 and one on May 28. Flies were first found ovipositing on June 2, when three were taken and several others heard. Between June 2 and June 14, females guarding their egg masses could be found on any day. After June 14, none were seen or taken, though egg masses were found as late as June 27. From these observations it appears that the period of adult activity

lasts only about 30 to 40 days in the latitude of northwest Arkansas.

It seems probable that the adult female of **G. chrysocoma** takes no food. Flies which emerged in insectary cages consistently refused to take either water or dilute honey, both of which are readily accepted by Tabanidae of several other species which the writer has had under observation. A small herd of dairy cattle were sometimes present in the woods where observations were made, and although the flies were abundant none were ever seen biting the animals. Still more convincing is the fact that the abdomens of females reared from collected larvae were found to be full of apparently fully developed eggs, when dissected immediately after emergence from the pupa. Evidently the eggs are formed, as in the **Oestridae,** from food taken while the fly is in the larval stage. Since the eggs apparently are ready for fertilization and deposition when the female emerges, and it is known that she spends the remainder of her life guarding them after oviposition, it appears likely that no food is taken. The mouthparts of the female are similar in size, structure, and component parts to those of species of Tabanidae known to be haematophagus.

Literature Cited

(1) Aldrich, J. M.
1892. A new genus and species of Tabanidae. Psyche, 6: 236-237.

(2) ———
1900. **Goniops** and other synonyms. Ent. News, 11: 531-533.

(3) ———
1905. A catalog of North American Diptera. Smithsonian Misc. Col. Vol. 46, No. 1444.

(4) Herms, W. B.
1915. Tabanids breeding in rice fields. Pan Pacific Ent. 4: 91-92.

(5) Hine, J. S.
1900. **Pangonia chrysocoma** Osten Sacken. Ent. News, 11: 392.

(6) ———
1903. Tabanidae of Ohio. Ohio Acad. of Sci. Special Paper No. 8.

(7) McAtee, W. L.
1911. Facts in the life history of **Goniops chrysocoma.** Ent. Soc. Wash. Proc. 13: 21-29.

(8) Malloch, J. R.
1917. A preliminary classification of Diptera exclusive of pupipara, based on larval and pupal characters with keys to imagines in certain families. Part I. Bul. Ill. State Lab. Nat. Hist. Vol. 12, Art. III, pp. 356-357,

(9) Osten Sacken, C. R.
1875. Prodrome of a monograph of the Tabanidae of the United States. Bost. Soc. Nat. Hist. Mem. Vol. 2: Part IV, No. 1, p. 368.

(10) Parman, D. C.
1928. Experimental dissemination of the Tabanid egg parasite **Phanurus emersoni** Girault and biological notes on the species. U. S. D. A. Circular 18.

(11) Walton, W. R.
1908. Notes on the egg and larva of **Goniops chrysocoma** (O. S.) Ent. News, 19: 464-465.

DISTRIBUTIONAL NOTES ON UTAH COLEOPTERA[1]

GEORGE F. KNOWLTON [2]

The purpose in preparing this report is to add to the known distribution of Utah Coleoptera. Little has been recorded concerning the distribution of most of the species here recorded, a number of them not having been previously reported from this state. The records pertain to recently determined specimens from the Utah Agricultural Experiment Station collection. The writer is indebted to Messrs. H. S. Barber, L. L, Buchanan, E, A. Chapin, W. S. Fisher, F. E. Blaisdell, and J. N. Knull for the identification of most of the forms recorded. Unless otherwise indicated, localities are in Utah.

Family **Carabidae**

Carabus taedatus Fab. Logan, May 17 (Knowlton).

1 Contribution from the Entomology Department, Utah Agricultural Experiment Station.

2 Associate Entomologist.

Authorized for publication by Director.

Opisthius richardsoni Kby. Lorenzo, Idaho, June 6, 1931 (W. Thomas).

Amora blanchardi Hayw. Timpie, April 15 (Knowlton).

Amora fallax Lec. Ft. Duchesne, July 12, 1932 (L. Cutler).

Celia californica (Dej.). Springville, June, 1930, and Snowville, June 7, 1930 (Knowlton).

Family **Staphylinidae**

Philonthus siegwaldi Mann. Willard, April 17, 1929 (Knowlton).

Ontholestes cingulatus (Grav.) Idaho Falls, Idaho, August 1, 1932 (R. J. Costley).

Family **Histeridae**

Hister abbreviatus Fab. Lewiston, August 1926 (Knowlton).

Hister ulkei Horn. Corinne, April 9, 1930 (Knowlton). Idaho.

Hister semiruber Csy. Clinton, June 10, 1931 (Knowlton); Ogden, May 18, 1929 (Pack); among **Salsola pestifer** at Snowville, August 22, 1931 (Knowlton.).

Platysoma depressum Lec. Logan, April 27, 1931 (Thomas).

Paromalus aequalis Say. Logan, April 10, 1931 (Thomas).

Hetaerius tristriatus Horn. Logan, April 16 (T. O. Thatcher).

Saprinus lugens Er. Logan, April 15, 1931 (Thomas).

Saprinus desertorum Mars. Kelton, June 24, 1932 (Knowlton); Snowville, Sept. 19, 1929 (Knowlton).

Family **Lampyridae**

Ellychia corrusa (L.) Logan, June 10, 1931 (Thomas).

Pyropyga nigricans (Say.) Ft. Duchesne, July 28, 1932 (Knowlton); Logan, June 9, 1931 (Thomas); Taylorsville, July 9, 1930 (Knowlton); Riverdale, June 10, 1931 (Knowlton).

Chauliognathus basalia Lec. Logan, December 5, 1907.

Family **Melyridae**

Collops hirtellus (Lec.) Dry Lake, July 5, 1929 (Knowlton).

Collops bipunctatus Say. Collected upon many occasions at Snowville, and in Cedar Valley, July 18, 1926 (Knowlton).

Collops punctulatus Lec. Grantsville, June 14, 1930 (Knowlton, Janes); Snowville, June 20, 1925 (Knowlton, Bowen).

Collops necopinus Fall. Ft. Duchesne, June 14, 1930 (Knowlton).

Collops quadrimaculatus (Fab.). Wellsville, July 29, 1903.

Listrus interruptus Lec. Skull Valley, May 4, 1929 (Knowlton).

Family **Cleridae**

Enoclerus laetus Klug. Iosepa, Skull Valley, August 8, 1929 (Knowlton, Bowen).

Trichodes simulator Horn. Far West, September 15, 1932 (Cutler).

Trichodes ornatus Say. Fort Duchesne, June 23, 1931 (R. L. Janes); Holliday, Wellsville, Providence (Knowlton).

Hydnocera humeralis Say. Cedar Creek, June 25, 1927 (Knowlton).

Family **Oedemeridae**

Calopus angustus Lec. Logan, April 15, 1932 (Stoffers).

Oxacis sericea Horn. On alfalfa at Hinckley, July 23, 1914; Timpie, Skull Valley, July 17, 1930 (Knowlton, M. J. Janes).

Family **Mordellidae**

Mordella melaena Germ. Sevier, August 27, 1927 (Knowlton).

Mordellistena sericans Fall. Bothwell, June 12, 1930 (Knowlton); Grantsville, June 13, 1930 (Knowlton); on sugar beets at Plain City, June 16, 1930 (Knowlton).

Mordellistena aemula Lec. On sugar beets at Lewiston, July 2, 1927 (Knowlton).

Anthobates nubilus Lec. Delle, July 9, 1930 (Knowlton); Ft. Duchesne, June 15, 1932 (Knowlton).

Family **Meloidae**

Macrobasis unicolor (Kby.) Logan, June 10, 1931 (Thomas).

Meloe tinctus Lec. On shadscale at Delle, April 1, 1932 (Knowlton).

Meloe afer Bland. Logan, June 3 (Thatcher).

Nemognatha bicolor Lec. Draper, June 23, 1926 (Knowlton).

Family **Rhipiphoridae**

Rhipiphorus mutchleri Rivnay. Logan, September 20, 1927 (Pack).

Family **Anthicidae**

Notoxus monodon Fab. Murray, August 17, 1929 (Knowlton).

Notoxus calcaratus Horn. On sugar beets at Provo, July 12, 1927 (Knowlton).

Tanarthrus salicola Lec. On shadscale at Delle, April 1, 1932 (Knowlton).

Family **Elateridae**

Adelocera profusa Cand. Logan, May 25, 1931 (Thomas); Salt Lake City, June 22, 1926 (Knowlton).

Aeolus livens (Lec.). Honeyville, April 13 (Knowlton); Logan, March 20 and 26 (Thatcher).

Aeolus amabilis (Lec.). Corinne, April 21, 1930 (Knowlton).

Ludius medianus (Germ.) Logan, April 20, 1931 (Thomas).

Hemicrepidius dilaticollis Mots. Providence, July 26, 1931 (Janes).

Elater apicatus Say. Logan, June 26, 1931 (Thomas).

Cardiophorus fenestratus Lec. Ft. Duchesne, July 17, 1932 (Stoffer).

Cardiophorus pubescens Bl. Hansel Valley, May 2, 1929 (Knowlton).

Family **Buprestidae**

Acmaeodera labyrinthica Fall. Low, May 26, 1930 (Knowlton).

Acmaeodera connexa Lec. Timpie, June 10, 1931 (Knowlton).

Acmaeodera lucia Fall. Low, June 26, 1929 (Knowlton).

Acmaeodera ornate (Oliv.). Providence, June 12, 1931 (Janes).

Dicerca prolongata Lec. Salt Lake City, June 22, 1926 (Knowlton).

Melanophila atropurpurea (Say). Murray, June 20, 1913.

Chrysobothris femorata (Oliv.). Smithfield Canyon, June 17, 1926 (Knowlton).

Agrilus walsinghami Cr. Bert, August 6, 1930 (Knowlton); Brigham City, September 2, 1927 (Knowlton); Randlett, July 14, 1927 (Knowlton); Timpie, July 17, 1930 (Knowlton, Janes).

Agrilus gibbicollis Fall. Salt Lake City, June 30, 1927 (Knowlton).

Family **Dermestidae**

Dermestes frischi Kug. Logan, March 2, 1927 (Pack).

Attagenus piceus Oliv. Magna, July 24, 1929 (Knowlton).

Family **Ostomidae**

Temnochila aerea (Lec.). Logan, September 25, 1932 (Thomas).

Calitys scabra (Thunb). Logan, April 2, 1932 (Stoffers, Cutler); on **Salsola pestifer** at Roosevelt, September 9, 1932 (Knowlton).

Family **Nitidulidae**

Glischrochilus fasciatus (Oliv.) Honeyville, and Magna, September 17, 1929 (Knowlton).

Glischrochilus quadrisignata (Say). Logan, July 11, 1931 (Thomas).

Family **Coccinellidae**

Hyperaspis lateralis Muls. Lucin and Showell, August 12, 1929 (Knowlton).

Hyperaspis gemma Csy. (or new?) American Fork, August 18, 1903.

Hyperaspis aterrima Csy. Grantsville, August 16, 1929 (Knowlton).

Hyperaspis taeniata Lec. Snowville, August 5, 1929 (Knowlton).

Hyperaspis fimbriolata Melsh. Green River, June 18 (Knowlton).

Hyperaspis inflexa Csy. Kelton, August 13, 1929 (Knowlton); Moab.

Hyperaspis postica Lec. On **Atriplex** at Rosette, August 11, 1931 (Knowlton).

Brachyacantha dentipes (Fab.). Manti, July 26, 1927 (Knowlton); Parleys Canyon, September 6, 1932 (Knowlton, Janes); Vernon, July 20, 1932 (Knowlton).

Scymnus creperus Muls. Mill Creek, June 3, 1908 (Titus); Plain City, July 7, 1925 (Knowlton); Provo (Titus); Snowville, August 8, 1929 (Knowlton); Spring Canyon, August 25, 1923 (Knowlton).

Scymnus haemorrhous Lec. On sugar beets at Ogden, July 31, 1929 (Knowlton).

Rhyzobius ventralis (Er.) Tia Juana, Mex. June 15, 1908 (Ball).

Ceratomegilla vittigera (Mann.). Corinne, September 9, 1925 (Knowlton); Farmington, July 23, 1930 (Knowlton).

Hippodamia americana Cr. Elsinore, on beets, July 26, 1927 (Knowlton); on beets at Farmington, August 15, 1929 (Knowlton). Logan; Ogden (Knowlton).

Hippodamia lecontei Muls. Providence, July 20, 1925 (Knowlton); Roy, July 31, 1929 (Knowlton).

Coccinella quinquenotata Kby. Providence, July 5, 1931 (D. M. Hammond); Roy, on beets, July 28, 1927 (Knowlton).

Coccinella monticola Muls. Fruitland, April 28, 1929 (Knowlton).

Cycloneda rubripennis Csy. Logan, August 5 (Knowlton); Providence, June 6, (Knowlton).

Cycloneda polita Csy. Benjamin, June 28 (Knowlton); Logan, May 27 (Knowlton) Willow Creek, June 12 (Knowlton).

Alla abdominalis (Say). Hurricane, June 26 (Knowlton); Leeds, June 26 (Knowlton).

Adalia bipunctata (L.) On sugar beets at Salt Lake City, June 22, 1925 (Knowlton).

Adalia annectans Cr. Blue Creek, July 11, 1929 (Knowlton); Logan, July 2, 1925 (Knowlton).

Adalia coloradensis Csy. Benson, July 23, 1909 (Titus, Hoff); Logan May 12, 1931 (Thomas).

Adalia transversalis Csy. Providence, June 11, 1931 (Hammond).

Anatis lecontei Csy. Brigham, July 5, 1929 (Knowlton); Providence, June 7, (Knowlton).

Exochomus septentrionis Ws. Grouse Creek, August 13, 1932 (Knowlton, Janes); Moab; Thompson. Also Grand Junction, Colorado.

Exochomus californicus Csy. Currant Creek, April 27, 1929 (Knowlton); Spanish Fork, June 7, (Knowlton); Willow Creek, June 12, (Knowlton).

Family **Tenebrionidae**

Telabis uteana Csy. Snowville, May 13, 1929 (Knowlton).

Hylocrinus laborans Csy. Delle and Iosepa, Skull Valley, July 24, 1929 (Knowlton).

Bothrotes picipennis Csy. Beaver, July 25, 1926 (Knowlton).

Gonasida elata (Lec.). Corinne, October 14, 1929 and Skull Valley, September 9, 1930 (Knowlton).

Eleodes humeralis Lec. Iosepa, Skull Valley, Utah, June 6, 1930 (Knowlton).

Eleodes extricata (Say). Mount Pleasant, August 20 and Trout Creek, August 19, 1929 (Knowlton).

Eleodes obscura (Say). Cache Junction, June 3, 1912 (H. R. Hagan).

Eleodes immunda Blais. Hyde Park, May 16, 1929 (Knowlton).

Eleodes hispilabris (Say.) Grantsville, May 4, 1929 (Knowlton).

Eleodes imitabilis Blais. Skull Valley, May 4, 1929 (Knowlton).

Eleodes pimelioides Mann. Mount Pleasant, August 20, 1929 (Knowlton).

Litheleodes cognata Hald. Bountiful, May 29, 1929 (Pack); Salt Lake City, May 29, 1909 (Titus.)

Blapylis patruelis Blais. Marysvale, June 25, 1906.

Metablapylis difformis Blais. Logan, April 4, 1929 (Pack).

Tenebrio obscurus Fab. Delle, May 26, 1930 (Knowlton).

Helops californicus Mann. Among **Cheirinia repanda** at Timpie, May 14, 1931 (Knowlton).

Family **Cerambycidae**

Spondylis upiformis Mann. Logan.

Stenocorus vestitus Hald. Logan, April 15, 1931 (Thomas); Providence, June 12, 1931 (Janes). Also collected at Grace, Idaho, June 21, 1931 (Knowlton).

Pachyta liturata Kby. Logan, August 4, 1931 (Thomas).

Acmaeops proteus (Kby.) Logan, August 5, 1903.

Callidium vancouverensis Van D. Logan.

Xylocruis cribratus Lec. Logan, August 3, 1931 (Knowlton).

Xylotrechus gemellus Csy. Logan, April 30, 1931 (Thomas).

Oxoplus corallinus Lec. On sage and rabbit brush at Bert, August 16, 1930 (Knowlton).

Crossidius ater Lec. Cedar Springs, August 30, 1929 (Knowlton).

Crossidius pulchellus Lec. Hansel Valley, Hansel's Mountains, Rattlesnake Pass and Snowville on August 22, 1931, abundant upon blooming rabbit brush **(Chrysothamnus)** and match brush **(Gutierrezia)** (Knowlton); Thatcher, August 24, 1927 (Knowlton).

Crossidius allgewahri Lec. Abundant upon **Chrysothamnus** and **Gutierrezia** at Curlew, Snowville, and across Curlew Valley, August 22, 1931 (Knowlton).

Crossidius intermedius Lec. Amalga, August 21, 1931, and abundant upon **Gutierrezia** in Hansel's Mountains, August 22, 1931 (Knowlton).

Batyleoma saturale (Say). Fort Collins, Colorado, July 29, 1902 (L. A. Titus).

Moneilema obtusa Lec. Fort Duchesne, July 27, 1932 (Cutler).

Hyperplatys maculata Hald. Providence, July 18, 1931 (Hammond).

Saperda calcarata Say. On **Populus,** Logan Canyon, July 1930 (Knowlton).

Mecas inornate (Say). Skull Valley, September 29, 1930 (Knowlton).

OBSERVATIONS ON RELAPSING FEVER FOLLOWING BITES BY ORNITHODORUS TURICATADUGES, IN A TEXAS CAVE.

W. G. BRUCE

Division of Insects Affecting Man and Animals
Bureau of Entomology
U. S. Department of Agriculture

Relapsing fever is not common in the United States, and it was not until recently that the tick **Ornithodorus turicata** was indicated as a carrier of a type of this disease. This brief account of the writer's experience with the disease corroborates and supplements in part other published accounts of the Texas outbreak indicated in the bibliography.

In the fall of 1930, seven men and boys explored a cave, known locally as Dead Man's Cave, located 5 miles east of Roanoke, Texas. It is near the top of a steep hillside about 150 feet above the creek bed. The cave consists of three rooms or chambers, averaging 4 feet in height, and with a total depth of about 50 feet. The walls and ceiling are of sandstone and floors are covered with 4 to 5 inches of dry sand.

Upon emerging from the cave the "explorers" found numerous ticks on their hands, necks, and clothes, but as the ticks were easily dislodged they were given no further thought except to note that they appeared to be different from those commonly found in that locality. In less than two weeks all but one of the persons became ill, the illness being characterized by high temperature, nausea, and extreme fatigue. After a few days, the patients rallied, but about one week later there was another rise in temperature and a return of the original symptoms. These rallies and depressions were repeated at regular intervals for several weeks; then the disease was properly diagnosed as relapsing fever. The patients responded favorably to the neoarsphenamine treatment.

Seeking to correlate the presence of ticks with relapsing fever, the writer visited the cave on December

10, 1930. There were large numbers of ticks(1) on the floor and walls in the far recesses of the cave. Altho the writer tried to avoid being bitten by the ticks, a few succeeded in attaching and feeding. All clothing was removed within two hours and every suspected tick bite was treated with tincture of iodine.

A loss of appetite was experienced on the evening of December 17. During the following days, there was a general feeling of fatigue, chills, headache, and aches in back, arms and legs. A cup of coffee induced energetic vomiting. The temperature rose to 104.5 degrees. On December 19 the disease was diagnosed as relapsing fever, and 0.45 gm. neoarsphenamine in 10 cc. of distilled water was administered intravenously.

The temperature subsided slowly and became normal after 30 hours. This reduction in temperature was accompanied by profuse perspiration and an abatement of the other symptoms, except that the general feeling of fatigue persisted for several days. There was no relapse. Complete recovery was slow, and the weakening effect of the disease was felt for six weeks.

Some of the ticks, collected from the cave, were permitted to feed upon a guinea pig. About 10 days later the guinea pig exhibited a loss of appetite, a general appearance of lassitude, and a high temperature and it persisted for several days. In about two weeks the guinea pig recovered and assumed a normal appearance. The writer was disabled with relapsing fever at the time and could not make detailed observations.

During the following year, Mr. E. C. Cushing, of the Bureau of Entomology, visited another cave which harbored ticks suspected of carrying relapsing fever. He took precautions to dress in especially prepared clothing to keep the ticks from feeding on him, but in due time he came down with the disease also.

The probable hosts of these disease-bearing pests

(1) *Ornithodorus turicata* Duges. Determined by Dr. F. C. Bishopp

in some of the larger and easily accessible caves are goats, sheep, and cattle, but Dead Man's Cave is inaccessible to these animals. It is more probable that the fox, ringtail cat, coyote, wildcat, rabbit, badger, and ground squirrel serve as hosts. Buzzards frequent caves and, since these ticks readily crawl upon any animal it is not unlikely that the buzzard transports infected ticks from one locality to another.

Bibliography

Brumpt, E.
Etude du **Spirochaeta turicatae,** n. sp., agent de la fievre recurrente sporadique des Etats-Unis transmise par **Ornithodorus turicata.** Comp. Rend. Soc. Biol. (Paris)
113 (28):1369. 1933.

Graham, M. G. and Weller, B.
Relapsing fever in central Texas
Amer. Med. Assoc. Jour.
95:1834. 1930.

Graham, M. G.
Relapsing fever endemic in Texas: Possibility of animal reservoir
Texas State Med. Jour.
27:226. 1931.

Kemp, Hardy A., Moursund, W. H., and Wright, Harry E.
Relapsing fever in Texas
Amer. Jour. Trop. Med.
13(4):425-435. 1933.

HYMENOPTEROUS PARASITES OF THE WESTERN APPLE CURCULIO IN NORTHEASTERN KANSAS (TACHYPTERELLUS QUADRIGIBBUS MAGNUS LIST, COLEOPTERA, CURCULIONIDAE)*

RALPH L. PARKER and P. G. LAMERSON
Kansas Agricultural Experiment Station.

Introduction

Information concerning three species of hymenopterous parasites peculiar to the western apple curculio was secured during the progress of research work on the biology and control of this pest in the vicinity of Troy, Doniphan county, Kansas. This account is a record of the observations made on the parasites of this insect during the years 1932 to 1933. Specimens of 3 species of reared parasites—**Eurytoma tylodermatis** Ashm., **Microbracon tachypteri** Mues., **Microbracon variabilis** (Prov.)—were identified by C. F. W. Muesebeck of the United States National Museum.

Methods

The parasites were reared from western apple curculio larvae. The apple curculio larvae were obtained from infested apples which were halved for examination. Often the pupal stage of the parasite had been reached before the apple was opened. This accounts to some degree for the lack of details obtained concerning the life histories of the 3 species concerned.

The most successful cages for rearing the parasites proved to be humidors made of glass fruit jars and shell glass vials containing moistened cotton batting. Desiccation on the halved apples had to be prevented in order to obtain successful emergence of the parasites.

Life History Habits

Since these parasites attack the host during the larval stage of its development, the rapidity of the parasite life history becomes a necessary consideration. The larval stage of the western apple curculio ranges between 13 to 28 days, as revealed by the rearing of specimens.

Eurytoma tylodermatis Ashm.

The literature shows **E. tylodermatis** to be a rather cosmopolitan parasite of weevils. Ashmead (1896)

*Contribution No. 424, Department of Entomology.

first described this insect as a parasite of **Tyloderma foveolata** Say, a weevil breeding in the stems of **Omagra biennis.** Pierce (1908) reports it as one of the 6 most important parasites of the cotton boll weevil. Pierce (1912) lists 16 weevil hosts for this parasite. Myers (1927) reared it from the larva of the moth **Lophoptilus eloisellus** Clem. List (1932) reported it as one of the most important parasites of the cherry curculio. **Tachypterellus consors cerasi** List, which accounted for from 25 to 30 per cent of the total parasitism. He also reported it from **Entedon tachypterelli** Gahan, an internal parasite of the cherry curculio. Pierce (1912, p. 63) found that it overwintered in the immature stages in the region of Texas. Muesebeck (a letter from H. Morrison, Identification and Classification of Insects, Bureau of Entomology, U. S. D. A. under date of Nov, 19, 1932) listed the 10 most important hosts of **E. tylodermatis** as:

Tyloderma foveolata Say, **Anthonomus grandis** Boh., **Anthonomus heterothecae** Pierce, **Anthonomus squamosus** Lec., **Conotrachelus elegans** Boh., **Orthoris crotchii** Lec., **Lixus scrobicollis** Boh., **Trichobaris texana** Lec., **Rhyacionia frustrana** Comst., **R. frustrana** var. **bushnelli** Busck. Hunter and Pierce (1912) in plate XVII gave good illustrations of this parasite.

Ashmead (1896) reported the distribution of **E. tylodermatis** in Virginia; Pierce (1912) reported it in Texas, Arkansas, Louisiana, Oklahoma, and Mexico; Dickerson and Weiss (1920) reported it in New Jersey; Meyers (1927) reported it in New York; and List (1932) reported it in Colorado.

E. tylodermatis as observed in its larval stage is an ectoparasite on the larval and pupal stages and dead adults of the western apple curculio. **E. tylodermatis** is normally a feeder on the larval stage of the western apple curculio. The instances where it has been observed feeding on the pupal and adult stages of the western apple curculio are comparatively rare. It is apparently a non-irritating feeder, and death of the larval host occurs gradually. List (1932, p. 58) quotes as follows from some of his notes taken July 11, 1929, in regard to the feeding habits of this parasite upon the cherry curculio:

"Watched a parasite larva feed upon a curculio

larva. The mouth parts are retracted so there appears to form a sucking pad; this was placed against the host and the two curved hooks could be seen to pierce the skin. The head of the parasite was repeatedly pressed against the host, making a very marked depression as if nursing, soon liquid could be seen to pass into the parasite and some free liquid collected about the mouth parts. After parasite moved there was no bleeding of host and no abrasion could be seen."

Two instances were noted where the parasitic larva was observed to be feeding upon the dead unemerged adults of the western apple curculio. Since the parasite starts feeding on the living larva of the western apple curculio and death of the larval host is most gradual, it would lead to the assumption that in rare instances the host is able to transform to the adult stage before death.

The larva of **E. tylodermatis** transforms to a pupa in the cavity hollowed out by the feeding of the larva of the western apple curculio. The pupal case is fragile and transparent, and the change to the adult stage can be easily observed.

The adults mate as soon as they emerge. One male was observed trying to mate with a female whose pupal case was not yet fully cast off. The male strokes the antennae of the female with his antennae preliminary to mating.

During the years 1932-1933 **E. tylodermatis** accounted for over one-half of the total parasitism of the western apple curculio in northeastern Kansas. During 1932 there were reared 38 specimens of this species and in 1933 there were reared 14 specimens.

Microbracon tachypteri Mues.

Muesebeck (1925) first described **M. tachypteri** as a parasite of the apple curculio, **Tachypterellus quadrigibbus** Say. This parasite appears to confine its parasitism to the genus **Tachypterellus** attacking the apple and cherry curculios. List (1932) reared a specimen from the cherry curculio. A. B. Gahan of the United States National Museum (List, 1932, p. 63) reported 3 specimens of this parasite and the 1 reared by List were the only 4 specimens known in 1920.

Muesebeck (1925) reported the distribution of **M. tachypteri** in West Virginia; Leonard (1926) reported

it in New York; and List (1932) reported it in Colorado.

Since most of the larval hosts upon which the larvae of **M. tachypteri** were feeding were already dead when observed, it could not be determined whether the parasite began its activity as an external or internal feeder. The larva of the parasite was observed devouring the remains of the larval host. At the time of transformation to the pupal stage the immature pupa was enclosed in a tough parchment-like cocoon from which the adult parasite emerged.

There is a pronounced variation in comparative size of the male and female, the male being much the smaller.

M. tachpyteri accounted for about 40 per cent of the total parasitism of the western apple curculio during the season of 1932, and 24 specimens were taken during the year. Only 1 specimen was taken during the season of 1933.

Microbracon variabilis (Prov.)

Provancher (1889) first described **M. variabilis** as (**Opius variabilis**). Muesebeck (1925) gave the synonomy of this insect. Muesebeck (a letter from H. Morrison under date of November 19, 1932) listed the following as the hosts: **Conotrachelus nenuphar** Herbst., **Tachypterellus quadrigibbus** Say, **Polychrosis viteana** Clem., and **Rhyacionia frustrana** var. **busnelli** Busck.

Provancher (1889) reported the distribution of **M. variabilis** in Quebec; Muesebeck (1925) reported it in Missouri, Connecticut, Pennsylvania, Virginia, and West Virginia; and Leonard (1926) reported it in New York.

No information concerning the life history of **M. variabilis** was secured except that the pupal stage is spent in cocoon, which has the appearance of a parchment-like membrane, from which the adult emerges.

M. variabilis is comparatively rare in the Missouri river valley region of Kansas. Only 3 specimens were reared during the years of 1932 and 1933.

Distribution and Host Selection Factors in Orchards

Distribution of parasites in the orchards infested with the western apple curculio often varied greatly in

the same orchard. Where there was a heavy cover of weeds beneath the trees, very few of the apples infested with the curculio were parasitized. Where there were no weeds and grass beneath the trees, often as many as 33 per cent were parasitized. Percentages of parasitized larvae appears to vary in the orchard in direct proportion to the amount of cover beneath the trees. Evidently the parasites follow the lines of least resistance in seeking their hosts, or the weed growth prevents the parasites finding the hosts.

Conclusion

The disparity in the degree of total parasitism for the years of 1932 and 1933 would indicate that little reliance should be placed on these parasites for the control of the western apple curculio. Usually a heavy infestation or an outbreak of an insect causing damage is followed by a heavy parasitism of the pest. This was true with the western apple curculio in the vicinity of Troy, Kansas in 1932.

The parasitism of this curculio for that year was of little benefit to the orchardist since the heavy fruit damage had already been done previous to the partial control of the pest by the parasites.

Literature Cited

Ashmead, W. H.
1896. Description of New Parasitic Hymenoptera II.
Trans. Amer. Ent. Soc., Vol. 23, pp. 218-219.

Dickerson, E. L., and Weiss, H. B,
1920. The Insects of the Evening Primrose in New Jersey.
Jour. N. Y. Ent. Soc., Vol. 28, pp. 32-74.

Hunter, W. D., and Pierce, W. D.
1912. The Cotton Boll Weevil: a Summary of the Investigations of this Insect up to December 31, 1911.
U. S. D. A. Bur. Ent. Bul. 114, p. 141. pl. XVII.

Leonard, M. D.
1926. A List of the Insects of New York.
Cornell Univ. Agri. Exp. Sta. Mem. 101, 1121 pp., (p. 898).

List, G. M.
1932. A Cherry Pest in Colorado.
Colo. Agr. Exp. Sta. Bul. 385, pp. 6-26 and 53-65.

Muesebeck, C. F. W.
1925. A Revision of the Parasitic Wasps of the Genus **Microbracon** Occurring in America North of Mexico.
U. S. Nat. Mus. Proc., Vol. 67, Art. 8, No. 2580, pp. 68-70.

Myers, M. A.
1927. Observations on the Habits and Life History of the Moth **Lophoptilus eloisellus.**
Jour. N. Y. Ent. Soc., Vol. 35, pp. 241-244.

Pierce, W. D.
1908. The Economic Bearing of Recent Studies of the Parasites of the Cotton Boll Weevil.
Jour. Econ. Ent., Vol. 1, pp. 117-122.

1912. The Insect Enemies of the Cotton Boll Weevil.
U. S. D. A. Ent. Bul. 100, pp. 49, 50, and 63.

Provancher, L'Abbe, L.
1889. Faune Entomologique du Canada. Additions et Corrections au Volume II Traitant des Hymenopteres. C. Darveau, Quebec, Canada.
Vol. 2, pp. 382 and 383.

TWO ERYTHRONEURA (HOMOPTERA, CICADELLIDAE).

*R. H. BEAMER, Lawrence, Kansas**

Erythroneura davisi n. sp

Resembling **Erythroneura huachucana** Beamer but vertex more pointed, veins of elytra whiter, color of elytra more definitely brown than pink, more nearly opaque marks on clavus not reaching tip, oedagus with one pair of processes and pygofer with two processes close together.

Color: General ground color yellowish white. Vertex with two velvety black spots on disc separated by one of their diameters. Pronotum more or less mottled with brown. Scutellum with velvety black spots in each basal angle, tip slightly darkened. Clavus with dark bar on mesal margin from tip of scutellum half way to tip, another heavier bar near claval suture, not reaching humeral angle nor tip of clavus, indefinitely hooked at tip. Coria dark throughout except veins and costal plaque, basal half suffused with brown. All markings with indefinite margins. Venter stramineous, more or less suffused with fuscous. Clypeus and mesosternum very dark.

Genitalia: Pygofer with two short processes or hooks very close together on outer dorsal portion. Style with foot of typical western type. Oedagus about as long as style; in lateral view fairly wide, gradually tapering, curving dorsally to sharp almost recurved tip with pair of retrorse processes just before tip reaching half way to base of shaft.

Holotype, male, **allotype,** female, 25 males and 43 females **paratypes,** Las Vegas, Nevada, June 1, 1933, E. W. Davis. Collected on **Prosela fremontii** (Torr.)

I take pleasure in naming this species for Mr. E. W. Davis who has been interested in leafhoppers for years.

Types and paratypes in the United States National Museum, Paratypes in Snow Entomological Collection and collection of of E. W. Davis, Salt Lake City, Utah.

Erythroneura amabilis McAtee

Erythroneura amabilis McAtee, W. L. Proc. Biol. Soc. Wash., Vol. 37, p. 32, 1924.

*Contribution from Dept. of Entomology, University of Kansas.

This species is here raised to specific rank. It belongs to the obliqua group but is a good species.

Genitalia: Style with large foot; heel large, base almost a right angle, posterior point longer than foot, narrow, almost parallel-sided slightly curved toward heel. Oedagus of medium size; shaft cylindrical, widest at base, sides almost parallel, tapering to sharp tip, with pair of sharp rather small lateral processes.

The above taken from a male from Suwanee Springs, Fla., July 29, 1930, R. H. Beamer, is here designated the **allotype.** The species was described from one female taken near Washington, D. C. I have before me the holotype, 1 specimen from Sea Cliff, L. I., 5 females and 1 male, Walnut, North Carolina, and 27 females and 4 males from Suwanee Springs, Florida.

A NEW NOTONECTA FROM MEXICO

*H. B. HUNGERFORD, Lawrence, Kansas**

Notonecta hintoni n. sp.

Size: Length 14 mm. to 15 mm.; width of pronotum 5.1 mm.

Color: Typically red and black. Some specimens may have the red replaced by tan. All have the head, pronotum and limbs yellow or gray and scutellum and membrane of hemelytron black. The hemelytra of females are typically red, excepting the membrane and a spot near the distal angle of the corium which are black. The males are darker, having the red of the corium and clavus more or less suffused with black. Middle and hind trochanters and femora with longitudinal median streaks of brown or black.

Structural characteristics: Head large, anterior outline as viewed from above flattened; vertex slightly longer than its anterior width, subequal in female; anterior margin of vertex less convex and plainly shorter than the frontal margin of the eye; anterior breadth of vertex: synthlipsis:: 19:7. Pronotum not more than one and two-thirds length of head; lateral margins divergent, straight to faintly concave; anterior angles about nor-

*Contribution from the Department of Entomology, University of Kansas.

mal, slightly more produced than in **N. lobata** Hungerford; lateral ledge as seen from the side sinuate and oblique and shorter than rear margin of eye below it; anterior half moderately explanate. Anterior lobe of membrane larger than the posterior one. Anterior trochanter of the male with an inconspicuous hook. Mesotrochanter rounded. The keel of the fourth abdominal sternite bare. Last abdominal sternite of female slender, sides not concave, tip incised. Last abdominal sternite of male unusually broad and rounded; male clasper with caudal margin deeply concave and hairy.

Location of types: Holotype, allotype and paratypes in the Francis Huntington Snow Entomological Museum. Paratypes will be sent to United States National Museum and to British Museum. Described from a series of twenty-nine specimens taken by Mr. H. E. Hinton in Real de Arriba, District of Temascaltepec, altitude 1960 meters, Mexico.

Comparative notes: General appearance that of **N. lobata** Hungerford. The males are distinguished from that species by the very different shape of the genital capsules and claspers. The females by having only an inconspicuous notch at tip of penultimate abdominal sternite. Lateral margins of last abdominal sternite of female not as curved as in **N. lobata** Hungerford.

This species belongs to **N. mexicana** A. & S. series for which I propose the new subgenus name **Erythronecta** with **N. mexicana** A. & S. as the subgenotype. This subgenus is characterized by having the keel of the fourth abdominal sternite always bare; eyes unusually broad, about as broad or broader than the short lateral margin of the pronotum; penultimate abdominal sternite of female slender. In **Paranecta** Hutch. and **Notonecta** Linn. (s. str.) the penultimate abdominal sternite of female is broad.

I also propose the new subgenus **Bichromonecta** with **N. shooteri** Uhler as subgenotype. Eyes flattened and anterior margins oblique; synthlipsis relatively broad; penultimate abdominal sternite of female triangular, tip incised and overlapping base of last segment. Males with broad stout hook on anterior trochanter. This subgenus is intermediate between **Paranecta** Hutch. and **Erythronecta** Hungerford.

MINUTES OF THE TENTH ANNUAL MEETING OF THE KANSAS ENTOMOLOGICAL SOCIETY.

April 28, 1934. University of Wichita, Wichita, Kansas.

BUSINESS MEETING

President P. A. Readio called the meeting to order at 11:45 a. m., in room 119, Science Hall.

Reports of Officers

Minutes of the ninth annual meeting were read and approved.

The secretary reported that on April 28, 1934, the Society had 126 subscribers to Volume VII (the current volume). The subscribers are distributed in the United States, Canada, England, Germany, Austria, Italy and Peru. Report approved.

The treasurer reported that on April 27, 1934, the Society had as assets in a savings account, $430.99; in the checking account of the treasurer, $97.28; the total of bills payable was $41.51, and that all bills against the Society were paid to date. Report accepted.

The editor sent his report in care of the president. He reported that he had material enough to complete the next two issues of the Journal and two long papers. He wished to know how these long papers should be handled for publication in the Journal.

The discussion of how to take care of the publication of long papers was conducted along the following lines. One fact is paramount, viz., that a variety of papers in each issue is desirable to create interest in the Journal. The size of any one issue can be increased in the number of pages if the author will pay for the extra cost of the issue. If reprints were desired, there would be, in addition, the regular cost of reprints as per the printed schedule. Another possibility is to publish one-half of the paper in one issue and the other half in the next issue, so that the paging would be continuous. It was suggested since other journals had published papers in small parts in various issues, this method might be followed in our journal for the publication of long papers. These suggestions were left with the Publication and Executive Committees for decision.

The Publication and Executive Committees have decided that there shall be a page limit for papers published in this Journal. This page limit has been set by these committees as 18 pages. The charge for all pages over

the page limit (18 pages) will be at cost. The publication of papers in small parts was not considered advisable.

The publisher, Warren Knaus reported that the NRA Code was producing some effects in the printing business. Labor was working a shorter number of hours each week and paper had increased in the price per pound under the NRA Code.

Report of Committees:

Wild Life—W. Knaus reported that the U. S. D. A. had suggested the buying of park areas. These would be fenced and a caretaker placed in charge. Mr. Knaus stated that he had already begun negotiations, under this plan, for the U. S. D. A. to take over the sand dune area in the vicinity of Medora, Kansas. This report was approved and Mr. Knaus was instructed to negotiate further to make the sand dune area of Medora, Kansas, a Wild Life Park.

Auditing Committee—This report was deferred to the section of final business at the request of the committee.

Appointment of Committees:

Nomination Committee	Resolutions Committee
D. B. Whelan, Chairman	D. A. Wilbur, Chairman
R. C. Smith	Milton Sanderson
R. H. Beamer	C. W. Sabrosky

Auditing Committee for 1934-1935
R. H. Painter, Chairman
P. B. Lawson

At the end of the morning business meeting three papers were presented to the Society.

A motion was made and carried that the society adjourn for lunch and that it convene again at 1:00 p. m. Adjourned at 11:49 a. m. and convened at 1:05 p. m.

The remaining papers on the program (as listed in the printed program on pages 71 and 72 of the April issue of Volume VII of the Journal) were read before the Society.

FINAL BUSINESS

Reports of Committees:

Resolutions Committee

(1) Be it Resolved: That the Kansas Entomological Society express its appreciation to the officials of the University of Wichita and to the officers of the Kan-

sas Academy of Science for the excellent facilities provided for its annual meeting.

(2) Be it Further Resolved: That the Society express its hearty approval and support of the work of the President F. D. Roosevelt committee on Wild-Life Restoration and they urge that a preserve in the Medora Sand Dune region in Reno County, Kansas, be established as soon as possible.

(3) Be it Further Resolved: That this Society commend the retiring officers for their services during the past year, and also express appreciation to the Publication Committee for maintaining the high quality of the Journal.

(Signed) Donald A. Wilbur, Chairman
Curtis W. Sabrosky
Milton Sanderson

It was moved that the resolutions be adopted. Motion carried.

Nomination Committee

President, H. R. Bryson
Vice President, D. B. Whelan
Secretary-Treasurer, R. L. Parker

Moved that the report of the Nomination Committee be adopted and the secretary be instructed to cast a ballot for the election of these officers. The secretary so cast the necessary ballot, electing the above named officers.

Auditing Committee

This is to certify that the undersigned members of the auditing committee examined the records of the Secretary-Treasurer, which included the record book, bank books, bills, deposit slips and similar records and found the receipts and expenditures were as the Secretary-Treasurer has reported. The auditors did not check the various mathematical processes for there appeared to be no occasion to question them. The auditors discussed with the Secretary-Treasurer the possibility of using a simpler method of making entries which, while making the record for each volume of the Journal more extensive would make the figures easier to check without verbal explanations of some of the lumped items. The records appear to be complete and well kept.

(Signed) P. A. Readio
R. C. Smith

Moved that the report be accepted. Report was approved.

President H. R. Bryson closed the meeting with a short speech of acceptance and then asked for a motion for adjournment. Motion made and accepted.

Adjourned at 4:20 p. m.

There were 36 members and friends present from Baxter Springs, Manhattan, Eureka, Lawrence, Wichita, Chanute, Sterling, McPherson and Arkansas City, Kansas and Lincoln, Nebraska.

R. L. Parker, Sec.

THE GREGARIOUS HABIT OF BEETLES

E. GRAYWOOD SMYTH, Entomologist,
W. R. Grace and Co., Sugar Estates, Trujillo, Peru.

Ethnologists have said that the preservation and advancement of man as a species through geologic time have been due primarily to his gregarious habit; that he has always found protection in numbers. Many other animals equally gregarious, like the buffalo, have not been preserved thereby from near extinction. Insects are notably gregarious, but as a usual thing it is the peculiar nature of their food that brings them together, rather than the desire for intimate association or mutual protection.

In the case of the beetles, although it is very often true that their gathering in swarms, or even in large numbers, is due to the presence of a favored species of flower, plant or tree, or a fungus or decomposing material, or perhaps to a peculiarity of the soil or topography that is to their liking, there are, none the less, many instances in which large numbers of a species will gather together in a given spot, or on a certain tree or plant, identical in all visible respects with others round about. The elements which prompt their choice of the particular spot as a rendezvous are invisible and to us mysterious, yet to the insects they are fixed and very tangible. One may recall cases, for instance, where a certain tree out of an entire grove or woodland containing many other trees of the same species, has proven attractive year after year to a species of insect that habitually passed up all the surrounding trees of its kind. Yet the vital attractive force was unfathomable.

Again, the mere desire for intimate association may hold a swarm of insects together, although in themselves the insects may have no apparent desire in common other than that for food. Where emergence of large numbers is simultaneous, they instinctively remain together, feed together, fly together, although from every viewpoint their dissipation might render much easier both their feeding and their reproduction. Such swarms are very common in beetles of the families Meloidae, Cantharidae and Lycidae, as well as in the Chrysomelidae and Otiorhynchidae, and certain phytophagous Scarabaeidae. In the Meloidae, the swarms may migrate for considerable distance and do an appreciable amount of damage to crops.

The recital of experiences in the encounter of beetles in swarms, by one who has covered a fair amount of land area and has been collecting for more than a score of years, might fill many pages. It seems fair, therefore, to restrict the mention of individual cases to those which stand out as most unusual; to occurrences which have never been duplicated, and are not liable to duplication in a considerable span of years. And while to the seasoned Coleopterist there is never a desire to shun or slight the smaller species, in a paper of this sort there can be small doubt that it will be of greater interest to the general reader if we confine remarks to the larger, or at least more conspicuous and better known, species. Nor can we feel the necessity of confining discussion entirely to "swarms," since in the case of a rare species it may be of far more interest to find a fair number of them, than to find literally a swarm of a very common one.

Where numbers are given they refer to those in Leng's "Catalogue of the Coleoptera of America, North of Mexico."

2. **Amblycheila baroni** Riv. This beetle was once so highly valued for its rarity that Dr. Walter Horn had paid twenty-five dollars for a single specimen for the Deutsches Museum in Berlin. On five successive insect expeditions of the University of Kansas, under the leadership of Doctor F. H. Snow, during the years 1903 to 1907, which the writer accompanied into remote parts of Arizona, this elusive beetle was the much sought quarry. Doctor Snow used to awaken the student collectors, long before daybreak, with the cheery call: "Blyc, blyc, blyc

it again, boys; let's be off." Finally the rare fellow was found, more by accident than by intention, and the incident seems worth recording. A member of the 1906 expedition, Mr. S. E. Crumb (now of the Federal Bureau of Entomology), was collecting near the noon hour high up among the craggy peaks of the Baboquivari Mts., sixty miles south-west of Tucson, on a hot day in July, when the sky darkened and a heavy rain blew up—a rare occurence for that locality and time of year. Taking refuge under a ledge of rock he was eating his lunch when he noticed brown objects moving slowly about over a bald, steeply sloping face of rock nearby, and on approach found that the Amblycheila adults had sallied forth in search of prey. They felt their way blindly over the bare rocky surface, gently waving the antennae, but ran rapidly for cover when disturbed. He took over twenty specimens before the sky cleared and the beetles retreated to the deep rocky fissures, where they were very inaccessible. A few additional specimens were found in ensuing days by other members of the party, by a systematic searching in very early dawn of the rocky cliffs near the camp. But no more dark or rainy days followed, and the real home of the beetle was rather too inaccessible to reach at an hour when crepuscular beetles venture forth, since one had to figure the possibility of confronting bear or mountain lion at the same hour.

66. **Cicindela pulchra** Say. As beautiful as the name implies, this insect might justly be termed royal from its generous proportions. Rarely found except singly, though occurring over a wide stretch of plainland throughout the southwest, it was on one occasion taken in rather large numbers on a small patch of bare prairie land in Western Kansas not exceeding four rods square. The splendid beetles ran about on a gently sloping bit of soil where an outcropping of reddish clay, washed bare by rains, lent variety to the otherwise monotonous stretch of prairie loam covered with buffalo grass, at a point about one mile due north of Coolidge, Kansas, on September 3rd, 1902.

67. **Cicindela pimeriana** Lec. To the Coleopterist. there is as great romance and thrill in his stalking of beetles, small though they be, when a rare find is made, as there is to the arctic explorer who discovers new lands, or to the paleontologist who finds a dinosaur new to science imbedded in the rock of a remote canyon. So

far as can be known, there was but one unique individual of this rare little beetle extant in collections when we discovered, or rediscovered, its habitat. That beetle was picked up by the Mexican Boundary Commission in southern Arizona prior to 1866, when Leconte described it. Decades later, in July, 1905, we found the pretty little blue-green beetles in abundance on a very limited area of partly bare, half sandy, level valley floor near artesian wells on the old Slaughter ranch in Cochise County, Arizona, due east of Douglas. A quarter mile wandering in any direction took one quite out of the colony, and none were found at any other point either up or down the valley within a radius of five miles. The place was exactly on the boundary line, midway between two monuments, and there seems no doubt that this is the point where the first specimen was picked up. It is a habitat seemingly unique.

71a. **Cicindela snowi** Csy. A variety so markedly differentiated from **C. nigrocaerulea** as result, no doubt, of its remote isolation by natural barriers, as to have become almost a distinct species. The male in particular differs greatly. We found what are probably the only specimens ever collected, in latter July, 1903, about two small, muddy, rapidly shrinking ponds, in company with **C. lemniscata,** at Martinez, Arizona, in that vast desert region extending from the Salt River to the Prescott Mountains. It is a place so dry that water, at that time, was brought by rail and paid for at a rate of five cents per pail. The beetles were in fair swarms, but disappeared completely when the ponds dried up.

71a. **Cicindela santaclarae** Bates. This is another noble species, comparable in size with the beautiful **C. chinensis,** and varies greatly in color. No other tiger beetle that we know is so difficult to net; it often rises high into the air and flies off a great distance. The only colony found, in several years of collecting over the southwest, inhabited a level, gravelly bench in the foothills atop a high ridge between two ravines flowing eastward onto the plain from the Santa Rita Mountains, southeast of Tucson, Arizona, in July 1917. Green and cupreous forms were both numerous, and occasional individuals of **C. horni** Schp., both black and blue forms, were found with this colony. The area ranged by the beetles did not exceed two acres in extent.

90a. **Cicindela segnis** E. D. H. The rough wagon road taken out of the Santa Rita Mountains, toward the end of August, by the Snow expedition of 1907, led a long way eastward from the foothills, then southward to Sonoita. Goaded by that spirit of inquisitive investigation that characterizes youth, the writer left the wagon and struck out by foot across the broad slope of prairie southeastward, to cover a less distance and overtake the wagon. Thus wandering, and at a spot on the half-naked prairie that had nothing whatever to distinguish it from any other dry area on the same prairie, there was stumbled upon a lively colony of this delicate little green beetle, so suggestive of **C. lemniscata** in markings, tho not in color. More than three dozen specimens were picked up in the space of perhaps fifteen minutes, within a small area, at the cost however of a panic of haste to overtake the wagon, which was nearly out of sight. Unlike the majority of tiger beetles, they made no attempt to fly. The chance find turned out to be a new and unique variety of the Mexican **C. debilis** Bates, larger in size, brighter in color.

—. **Cicindela cyaneiventris** Chev. A long, hard, two days' ride on horseback, from the sweltering coast town of Coatepeque, up and up along the narrow, slippery and dangerous path, fording streams and skirting gorges, mud bespattered and drenched from the sweep of the tropical Guatemalan rain forest, and finally to the fog-bathed town of San Cristobal Cucho, some eight or nine thousand feet above sea level; then another day's ride down a yet steeper path some three thousand feet or more into the bowels of La Barranca. And here was uncovered, in a small sandy field perhaps a hundred feet above the river bed, a prolific colony of this rare little beetle, of which one is very glad to find so many as a half dozen specimens in a season elsewhere.

—. **Cicindela radians** Chev. This beautiful little insect, with a veritable rainbow on its back, is one that would inspire enthusiasm in the dryest and most hardened collector. Returning down the steep mountain path toward the coast from San Cristobal Cucho, on June 4th, 1923, at an altitude of perhaps six thousand feet, a small colony of them was found on a steep, wet, moss-covered clay bank beside the road. The little beetles were hard to follow in flight, and were given to alighting on the foliage, as does our American **C. sexguttata,** and remain-

ing there a few moments before dropping or flying back to the mossy ground. A few more were taken the same day near the coast, on a similar moss covered wet clay bank, at an altitude perhaps two thousand feet lower. It appears that their habitat is a very specialized one.

—. **Staphylinus fulvomaculatus.** Perhaps the largest and finest member of its family, this handsome beetle has habits rather unusual for the genus, and seemingly highly specialized. The discovery of its habitat was quite accidental. While studying the bean beetle (**Epilachna corrupta** Muls.) in a small bean field in rich bottom land near Cuernavaca, Mexico, two specimens were captured flying about the field. Something other than carrion was attracting them, and curiosity led to the discovery of their objective. At the foot of a stone wall the active members of a thickly populated nest of the parasol ant, **Atta** sp., had laboriously thrown out a large heap of refuse, quite a foot deep and more than two across. It seemed to consist of decomposing particles of leaf mold and the woody parts of fungi; perhaps it was the cleanup and discarding of abandoned fungus gardens to make room for the new. There was no perceptible offensive odor to this refuse heap, yet it possessed the power to attract the beetles from a considerable distance. Digging into the pile brought to light a nice series of this fine beetle and twice as many of the larvae, and quite as many adults, and a few larvae, of the smaller but equally rare Staphylinid, **Glenus flohri.** These two beetles and their larvae had a wide variety of other insects present to prey upon, including members of the Histeridae, Nitidulidae, Tenebrionidae and Scarabaeidae, and various Dipterous larvae. The refuse heap proved a prolific source of material.

—. **Schizochilus versicolor** Grav. In a verdant meadow pasture at Santa Lucrecia, in the Isthmus of Tehuantepec, Mexico, on August 8, 1923, I stumbled upon this very oddly shaped beetle, a bit suggestive of our American **Ontholestes capitatus** (Bland), but far more fantastic in body design. They were flying about cow manure in the shade of a large Ficus tree, and looked more like wasps than beetles as they flew. Quite wary, many of them escaped capture, and such as alit on the manure again took wing quickly when approached.

7976. **Pyrota tenuicostata** Dug. A swarm of this

species invaded, and did much damage to, an alfalfa field in the South Texas Gardens, at Brownsville, Texas, on May 22, 1912. There were tens of thousands of them in the swarm, and by the first evening they had defoliated a third of the field. A photograph was taken of them. Their advance across the field was quite as destructive, though not as rapid, as that of migratory locusts.

——. **Lytta cardinalis** Chev. The sudden appearance of swarms of Meloid beetles, whose larvae are wholly parasitic or predacious on other insects, in the complete absence of similar swarms of the host insects, is one of the anomalies of Nature that scientists have never been able to explain. Why should such large numbers of the beetles hatch simultaneously, and what impulse prompts them to stay close together, eat together, migrate together? On October 29, 1922, I ran across a swarm of this handsome beetle, (whose size would indicate that its host must be a very substantial one) busily engaged in devouring the large, purple blossoms of a morning glory vine (Ipomoea) growing along a wall near Cuautla, state of Morelos, Mexico. A series of 128 adults was bottled, and lack of space prevented keeping more of them. When put into formalin solution, they turned the liquid to bright purple, of the same shade as the blossoms upon which they had fed, and several changes of liquid, at two week intervals, were necessary before the preservative remained clear.

——. **Lytta eucera.** This beetle may be well classed as a species of economic importance, since it feeds upon all Cucurbitaceae, cultivated as well as wild, and is quite common in Mexico from Mexico City southward. On September 20, 1923, over a hundred of them were collected at Oaxaca, Mexico, within a space of a few square yards in a small garden. They had completely destroyed a squash vine and were moving on to other vines nearby.

8116a. **Tegrodera aloga** Skin. One of the most striking Meloids of the North American fauna and an inhabitant of the desert region, this is a variety of **Tegrodera erosa** Lec., from which it differs by having a red thorax instead of black. A large swarm of them was found voraciously eating the foliage in an alfalfa field at Sacaton, Arizona, on an Indian reservation in the Gila River Valley not far from Phoenix, Arizona, on May 27, 1911. The swarm was moving northward.

REPRINT PRICES
JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY.

pp.	25 cop.	50 cop.	100 cop.	500 cop.
1— 2	$ .50	$ .75	$ 1.40	$ 6.50
3— 4	1.00	1.75	2.80	11.00
5— 8	1.40	2.80	5.60	20.00
9—12	2.00	4.00	8.00	32.00
13—16	2.50	5.00	9.00	36.00
17—20	3.00	6.00	10.00	40.00
21—24	3.50	7.00	11.00	44.00
25—28	4.00	8.00	12.00	48.00
29—32	4.50	9.00	13.00	52.00
Tables—for setting up—$1.75 per page.				
Covers	—	—	2.50	7.50

Subscription in the U. S. A., $1.00 per year. Single Copy, 40 cents.

NOTICE

Foreign subscriptions $1.25 per year, beginning with Volume 8, January, 1935.

Volume VII, No. 3, July, 1934. Mailed July 11, 1934

CONTENTS OF THIS NUMBER

BIOLOGICAL NOTES ON GONIOPS CHRYSOCOMA (O. S.) (DIPTERA: TABANIDAE)—H. H. SCHWARDT 73

DISTRIBUTIONAL NOTES ON UTAH COLEOPTERA—GEORGE E. KNOWLTON 79

OBSERVATIONS ON RELAPSING FEVER FOLLOWING BITES BY ORNITHODORUS TURICATA DUGES IN A TEXAS CAVE—W. G. BRUCE 87

HYMENOPTEROUS PARASITES OF THE WESTERN APPLE CURCULIO IN NORTHEASTERN KANSAS—RALPH L. PARKER and P. G. LAMERSON 90

TWO ERYTHRONEURA (HOMOPTERA, CICADELLIDAE) — R. H. BEAMER 96

A NEW NOTONECTA FROM MEXICO—H. B. HUNGERFORD 97

MINUTES OF THE TENTH ANNUAL MEETING OF THE KANSAS ENTOMOLOGICAL SOCIETY 99

THE GREGARIOUS HABIT OF BEETLES — E. GRAYWOOD SMYTH 102

To be Concluded in Vol. VII, No. 4.

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

Publication Office, 119 South Main Street, McPherson, Kansas. W (arren) Knaus, Publisher

A quarterly journal published in January, April, July and October, devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by International Postal Money Order or by a draft on a New York bank and payable in U. S. A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to the office of Publication, 119 South Main Street, McPherson, Kansas.

KANSAS ENTOMOLOGICAL SOCIETY

President H. B. Bryson, Kansas State College, Manhattan.
Vice-President D. B. Whelan, University of Nebraska, Lincoln.
Sec.-Treas. R. L. Parker, Kansas State College, Manhattan.